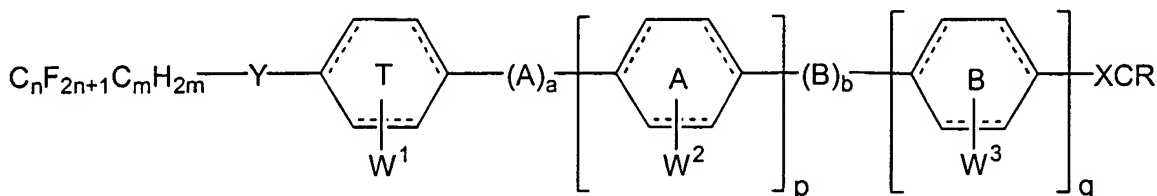


## CLAIMS

We claim:

1. A chiral, non-racemic liquid crystal composition which comprises an achiral liquid crystal host and up to about 100% by weight of one or more chiral, non-racemic compounds having the formula:



wherein n and m are integers ranging from 1 to about 20;

a, b, p and q are either 0 or 1, when p is 0, a is 0 and when q is 0, b is 0;

Y is a single bond or an oxygen;

X is selected from the group consisting of a single bond, oxygen, -CO-, -O-CO-, and -CO-O-;

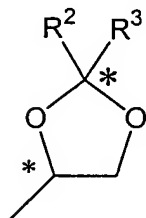
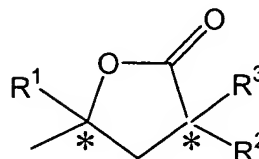
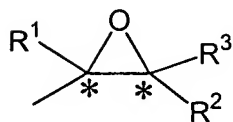
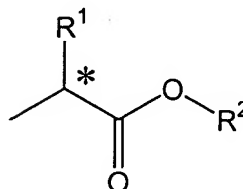
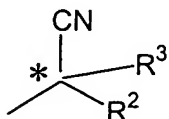
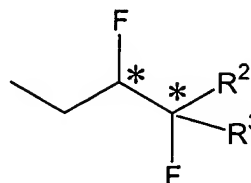
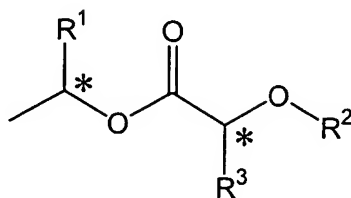
CR is a chiral, non-racemic tail group except that CR cannot be a chiral hydrocarbon tail;

A and B, independently, are linker groups that can be selected from the group consisting of -CO-, -O-CO-, -CO-O-, -CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>-O-, -O-CH<sub>2</sub>-CH<sub>2</sub>-, -C≡C-, -C=C-, and -C=C-C=C-;

W<sup>1</sup>, W<sup>2</sup>, and W<sup>3</sup>, independently, represent one or more optional substituents on core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, nitro and nitrile; and

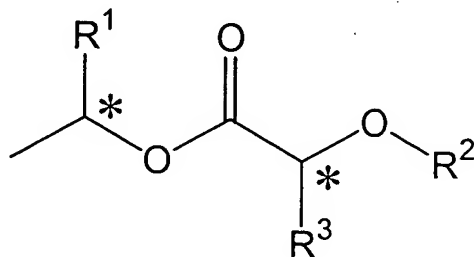
rings T, A and B together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH<sub>2</sub> groups or CH groups are replaced by -N-, NH-, -O- or -CO-.

2. The composition of claim 1 wherein CR is selected from the group consisting of :

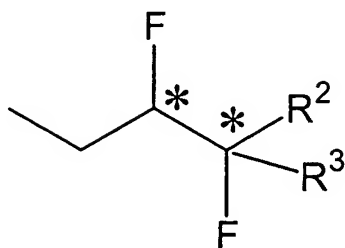


wherein \* indicates an asymmetric carbon;  $R^1$  and  $R^3$ , independently of each other, are lower alkyl or alkenyl groups optionally substituted with one or more halogens, and  $R^2$  is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more  $CH_2$  groups are replaced with  $-S-$ ,  $-O-$ ,  $-CO-$ ,  $-CO-O-$ ,  $-O-CO-$ , or  $-Si(R')_2$ , and where  $R'$  is a lower alkyl optionally substituted with one or more halogens.

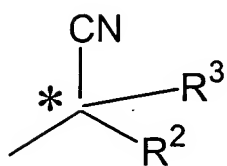
3. The composition of claim 1 wherein CR is:



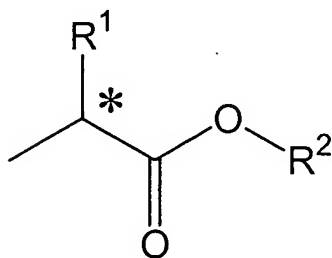
4. The composition of claim 1 wherein CR is:



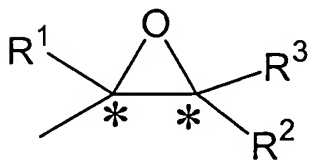
5. The composition of claim 1 wherein CR is:



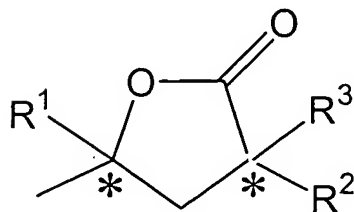
6. The composition of claim 1 wherein CR is:



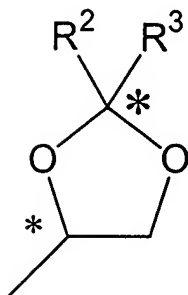
7. The composition of claim 1 wherein CR is:



8. The composition of claim 1 wherein CR is:

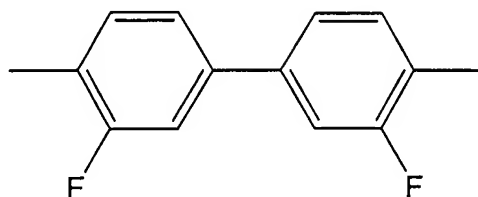


9. The composition of claim 1 wherein CR is:

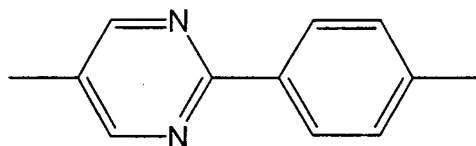


10. The composition of claim 1 wherein the chiral nonracemic compound has a biphenyl mesogenic core.

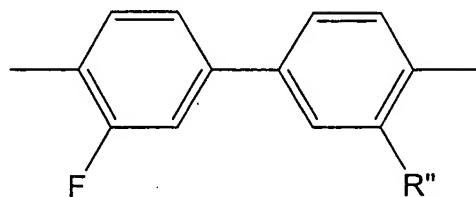
11. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



12. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



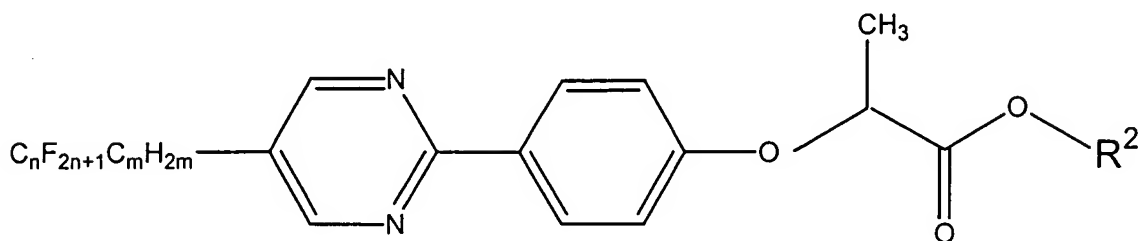
13. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



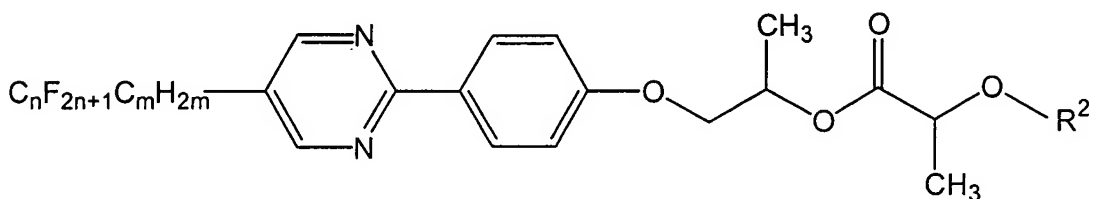
where R'' is a lower alkyl group.

14  
15. The composition of claim 1 wherein the host is MX6111.

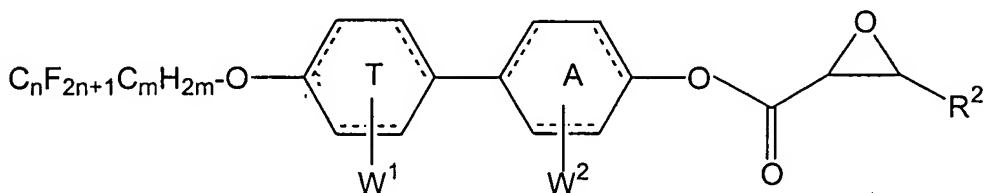
15  
16. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



16  
17. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



17  
18. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



18  
19. The composition of claim 18 wherein in the chiral nonracemic compound both of rings T and A are phenyl rings in which one or two of the CH groups can be replaced with a N and wherein  $W^1$  is selected from the group of halogens, alkyl groups or haloalkyl groups.

19  
20. The composition of claim 1 wherein in the chiral nonracemic compound  $n = m$ .

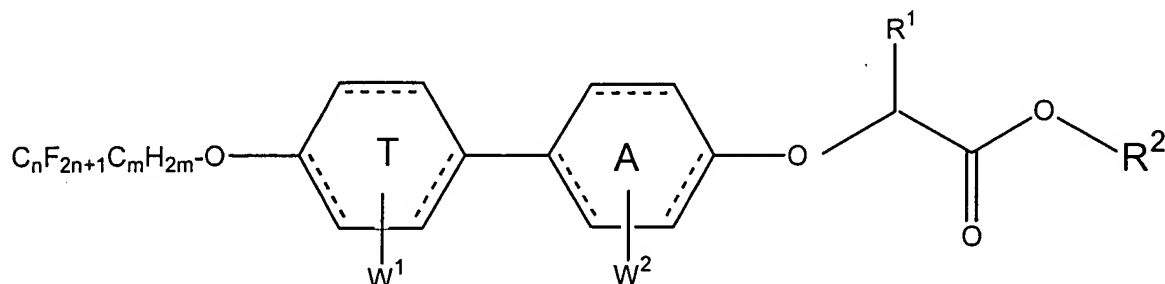
20  
21. The composition of claim 1 wherein in the chiral nonracemic compound Y is O.

21  
22. The composition of claim 1 wherein the chiral nonracemic compounds are present in the composition at a level of 10% or less.

22  
23. The composition of claim 1 which has Ps of 10 nC/cm<sup>2</sup> or more at room temperature.

23  
24. The composition of claim 23 wherein the chiral nonracemic compounds are present at a level of 5% by weight or less.

24  
25. A chiral nonracemic compound having the formula:

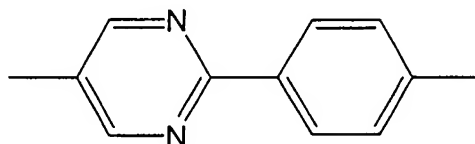


where n and m are integers ranging from 1 to about 15,  $W^1$  and  $W^2$ , independently, represent one or more optional substituents on mesogenic core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, and nitrile; rings T and A together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring  $CH_2$  groups or CH groups are replaced by -N-, NH-, -O- or -CO-;  $R^1$  is a lower alkyl or alkenyl group optionally substituted with one or more halogens and  $R^2$  is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more  $CH_2$  groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si( $R'$ )<sub>2</sub>, and where  $R'$  is a lower alkyl optionally substituted with one or more halogens.

25  
26. The compound of claim 25 wherein  $n = m$ .

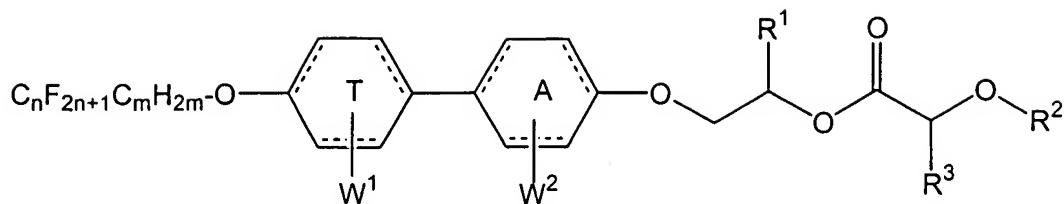
26  
27. The compound of claim 25 wherein  $R^1$  is a methyl group.

27  
28. The compound of claim 25 wherein the mesogenic core is:



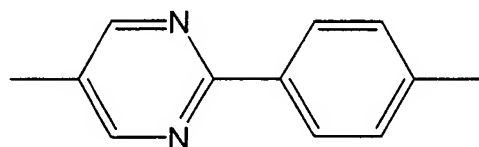
28  
29. The compound of claim 25 wherein the mesogenic core is biphenyl.

29  
30. A chiral nonracemic compound having the formula:

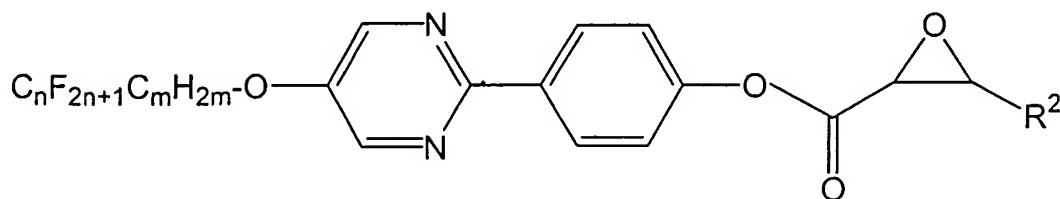


where n and m are integers ranging from 1 to about 15,  $W^1$  and  $W^2$ , independently, represent one or more optional substituents on mesogenic core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, and nitrile; rings T and A together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring  $CH_2$  groups or CH groups are replaced by -N-, NH, -O- or -CO-;  $R^1$  and  $R^3$  are lower alkyl or alkenyl groups that are optionally substituted with one or more halogens and  $R^2$  is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more  $CH_2$  groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si( $R'$ )<sub>2</sub>, and where  $R'$  is a lower alkyl optionally substituted with one or more halogens.

- 31.<sup>32</sup> The compound of claim 30 wherein  $n = m$ .
- 32.<sup>31</sup> The compound of claim 30 wherein  $R^1$  and  $R^3$  are both methyl groups.
- 33.<sup>32</sup> The chiral nonracemic compound of claim 30 wherein the mesogenic core is biphenyl.
- 34.<sup>33</sup> The chiral nonracemic compound of claim 33 wherein the mesogenic core is:



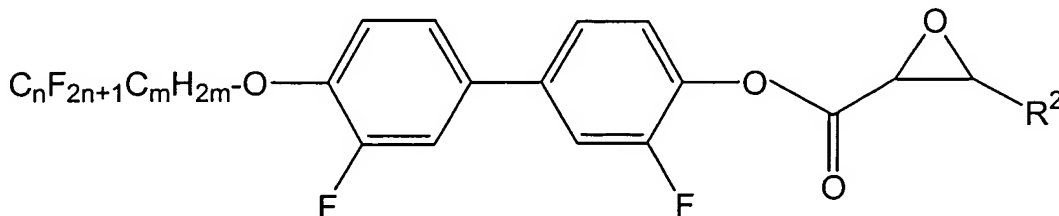
- 35.<sup>34</sup> A chiral nonracemic compound having the formula:



where n and m are integers ranging from 1 to about 15 and R<sup>2</sup> is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH<sub>2</sub> groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')<sub>2</sub>, and where R' is a lower alkyl optionally substituted with one or more halogens.

37. The compound of claim 36 wherein n = m.

38. A chiral nonracemic compound having the formula:



where n and m are integers ranging from 1 to about 15 and R<sup>2</sup> is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH<sub>2</sub> groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')<sub>2</sub>, and where R' is a lower alkyl optionally substituted with one or more halogens.

39. The compound of claim 38 wherein n = m.

40. An optical device comprising one or more compounds of claim 1.